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Locality Records for Some Endemic Australian Drosophilidae Based on Winter Collections

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Abstract: The results of a preliminary survey of endemic Drosophilids in Victoria and Queensland are reported. Comments on collecting techniques and site characteristics are presented for several species.

INTRODUCTION

Investigations of the ecology and genetic architectures of response to physiological stress of cosmopolitan species of *Drosophila* have added to our understanding of population and behavioural biology (Parsons 1974). Simultaneously, work with rapidly speciating endemic forms has contributed to the development of modern evolutionary theory (for example Dobzhansky & Spassky 1959, Carson 1970, Carson, Hardy, Spieth & Stone 1970). Nonetheless in no case has the study of natural populations been conducted concurrently with cosmopolitan and endemic species in the same area. Such studies would enable a direct comparison of population structures, responses to physiological stress and reproductive strategies, hence providing direct evaluations of the extent of microhabitat differentiation under known environmental variables. Additionally, such studies would permit an evaluation of the kinds of genetic architecture required for success in broad and narrow niche species—so far attempted for the cosmopolitan sibling species, *D. melanogaster* and *D. simulans* (Parsons 1975). Extensive work has also proceeded with endemics of the obscura and willistoni groups (for example Dobzhansky & Spassky 1959, Dobzhansky, Anderson & Pavlovsky 1966).

Australia would seem to offer an ideal base for such studies, because of its geographical position and geological history. Australia offers a diversity of habitats and yet relatively few endemic species of drosophilids have been reported. We therefore decided to begin a systematic effort to locate endemic species using techniques that had not been specifically applied to this group of flies.

COLLECTING TECHNIQUES AND SITE IDENTIFICATION

Collecting techniques included intensive sweeping with several kinds of net, mouth aspiration of individual flies, and the setting out of bait. Of the various fermenting and non-fermenting baits tried (tomato, pear, potato, apple, orange, banana), only orange (Victoria) and banana (Queensland) attracted any flies. In mixed forest, collecting near a broadleaf shrub or tree that was not the common one in the area was rewarding.

COLLECTION RECORDS

Sites in Victoria were predominantly fern gullies characterized by tree fern (*Dicksonia*), gleicheniad and *Culcita* ferns and *Pomaderris aspera* with some sites having *Nothofagus cunninghamii* or *Eugenia smithii*. These sites are generally in sheltered locations in mountainside gullies, and may have tall eucalypts constituting the highest canopy. There is generally permanent water flowing through the gullies. Those sites not fern gullies and productive of flies, were sheltered by thick low tree or tall shrub associations, with a somewhat reduced light intensity but still well above the light intensity of fern gullies. Flight activity was not noted for *Drosophila* or other aealypterate flies at temperatures below about 12°C. At lower temperatures, flies could be aspirated from tree fern or the underside of other leaves where they were remaining motionless, or flies could be captured by disturbing wet leaf litter while sweeping. Temperatures ranged from 10° to 14°C during collecting trips (June-September 1974) in Victoria in the Otway Ranges, Wilsons Promontory, and Kinglake National Park.

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Collections from Victoria (Table 1) suggest that *D. inornata* is the most common endemic species, at least in the sites surveyed. In Wilsons Promontory National Park, several specimens were taken when sitting at low temperatures (less than 12°C) on *Lonicera japonica* (Caprifoliaceae) which has aromatic flowers, and many more were swept at 1 m from the ground (13°C) on *Leptospermum phylicaides*, a member of the aromatic Myrtaceae. *D. inornata* was attracted to bait made of oranges (Rutaceae) where it could be found below the usual collecting temperature. Baits of the other fermenting fruits were not successful. Some specimens were captured in a thicket of flowering bush pea *Pultenaea mollis* and a female was found inside the corolla of *Epacris impressa*, white variety. These findings suggest that this species is not restricted to a particular and highly specific host plant, but is often found in association with aromatic plants of various types. The bush pea thickets serve as a windbreak on Wilsons Promontory, and with higher ambient temperatures, there may be movement of the flies upwards. Indeed, during periods when the sun shone on small patches of ground, *D.* sp.-2 and *D. inornata* were seen hovering over bracken fern some 1-2 m from the ground. This is rather similar to the effect of spotty sunshine on activity seen while collecting in Hawaiian forests (Grossfield 1968).

Queensland sites were either dense rain forest or moderately thick growth forest near the coast between Cairns and Innisfail. Temperatures ranged from 15°C in open forest to 18-22° in rain forest during a collecting trip in July 1974. The ground and leaf litter was quite dry.

The Queensland collections revealed more species than Victoria, but showed a similar grouping of 'rare' and common forms. Some additional specimens were obtained which cannot conveniently be placed in known genera at this time and are excluded from Table 1. Two specimens of *D.* sp.-9 and no other species came to banana bait. Other than the cosmopolitan *Drosophila* species, only *Scaptomyza australis* is found in both Victoria and Queensland. Records of other genera of the Drosophilidae are given in Table 1, again revealing more diversity in Queensland than in Victoria.

D. sp.2 (Victoria) and *D.* sp.-3 (Queensland), morphologically similar to each other, were collected in almost identical habitats—sweeping under bracken fern near a stream bed. In general, August 1974 was quite dry in Queensland and unless one were in the vicinity of a flowing stream, flies were deep in leaf litter on the forest floor. These species seem quite susceptible to desiccation and may well minimize the stress by behavioural means, a stress not present in Victoria at this time.

DISCUSSION

Overall there are a number of species of drosophilids in Australia that are unreported, and do not appear to be obtainable with the usual *Drosophila* collecting techniques of setting out bait cans of fermenting bananas, but which are obtainable

TABLE 1

COLLECTION RECORDS OF DROSOPHILIDAE

VICTORIA (June-September 1974)		
Genus and species	♀♀	♂♂
D. inornata	26	7
D. sp. undescribed — 1	5	8
D. sp. undescribed — 2	1	
Scaptomyza australis	1	
Leucophenga poeciliventris	1	

QUEENSLAND (July 1974)		
Genus and species	♀♀	♂♂
D. pseudotakahashii	7	5
D. sp. undescribed — 3	1	
D. sp. undescribed — 4	2	
D. sp. undescribed — 5	1	
D. sp. undescribed — 6		1
D. sp. undescribed — 7	1	
D. sp. undescribed — 8	1	
D. sp. undescribed — 9	10	8
Leucophenga sp. — 1	1	
Leucophenga sp. — 2	1	
Leucophenga sp. — 3	1	
Liodrosophila sp. — 1	1	
Liodrosophila sp. — 2	1	
Microdrosophila sp. — 1		1
Scaptomyza australis		1

Note: All Victorian flies were collected in Wilsons Promontory sites (Chinamans Creek, Growlers Creek, Roaring Meg Creek) except for 3 *D. inornata* (2 ♀♀, 1♂) and 1 *S. australis* ♀ which were collected in the Otway Ranges in Paradise Valley, and 1 *D. inornata* ♀ collected at Ferny Nook, Kinglake National Park.

by sweeping with a net. Some species may have an association with aromatic trees and shrubs, e.g. the Myrtaceae. In Victoria, the association of *Drosophila* with fern gullies needs further exploration, especially as the resources used by the endemics are still unknown. Whether the association with *Dicksonia* is based upon temperature-humidity relationships or upon the utilization of *Dicksonia* itself as a resource is difficult to say. Until laboratory culture is possible no definitive answers are possible. It is, however, noteworthy that in relation to flora and climate, the Victorian fern gullies appear to have some parallels with some Hawaiian habitats where a massive adaptive radiation of the Drosophilidae is known (Carson et al 1970).

The collection sites are discrete and identifiable, leading to the presence of isolated populations, and offering a model system for studying essentially continental 'islands' where these populations exist. Thus, it would appear that Australia offers a clear opportunity for comprehensive and concurrent studies of both cosmopolitan and endemic species of the Drosophilidae.

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